**Brock Parrott**

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**BSC 307**

**Evolution of Populations-Unit Plan**

Part 1: Textbook Concept list

|  |  |  |  |
| --- | --- | --- | --- |
| Concept | Definitely Include? | Maybe Include? | Don’t Include? |
| Genetic Variation | X |  |  |
| Single-Gene and Polygenic Traits | X |  |  |
| Natural Selection on single-gene and polygenic traits | X |  |  |
| Genetic Drift | X |  |  |
| Evolution Versus Genetic Equilibrium | X |  |  |
| Hardy-Weinberg Principle | X |  |  |
| The Process of Speciation | X |  |  |
| Isolating Mechanisms | X |  |  |
| Testing Natural Selection in Nature | X |  |  |
| Speciation in Darwin’s Finches | X |  |  |
| Evolution Since Darwin | X |  |  |

Part II: Illinois Learning Standards Concept List

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Concept | Descriptor | Definitely Include? | Maybe Include? | Don’t Include? |
| Genetic Variation | H.12A.2 Apply scientific inquiries or technological designs to correlate the basis of cellular and organism reproductive processes, correlating possible genetic combinations to the type of reproductive process, diagramming and comparing mitotic and meiotic cell division, or distinguishing asexual and sexual (egg, sperm and zygote formation) reproduction with examples. | X |  |  |
| Single-Gene and Polygenic Traits | H.12A.2 Apply scientific inquiries or technological designs to correlate the basis of cellular and organism reproductive processes, correlating possible genetic combinations to the type of reproductive process, diagramming and comparing mitotic and meiotic cell division, or distinguishing asexual and sexual (egg, sperm and zygote formation) reproduction with examples. | X |  |  |
| Natural Selection on single-gene and polygenic traits | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Genetic Drift | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Evolution Versus Genetic Equilibrium | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Hardy-Weinberg Principle | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| The Process of Speciation | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Isolating Mechanisms | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Testing Natural Selection in Nature | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Speciation in Darwin’s Finches | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |
| Evolution Since Darwin | I.12A.5 Apply scientific inquiries or technological designs to explain tests of evolutionary evidence, analyzing acceptance of geologic and fossil records, researching comparative anatomy, embryology, biochemistry and cytology studies of analogous and homologous structures. | X |  |  |

Use the table below to complete part 3 of your Unit Plan Assignment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Concept | This Unit? | Another Unit? | Leave Out? | Rationale | Related ILS |
| Genetic Variation | X |  |  | Students need to know how genes cause variation and the different sources of genetic variation. | **12.A.4a** Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. |
| Single-Gene and Polygenic Traits | X |  |  | Students need to know the differences between traits that are caused by a single gene and by multiple genes. | **12.A.4a** Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms. |
| Natural Selection on single-gene and polygenic traits | X |  |  | Students need to be able to know how natural selection causes changes on single-gene and polygenic traits and how it leads to evolution. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Genetic Drift | X |  |  | Students need to be familiar with additional sources of evolutionary change and how it effects small populations. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Evolution Versus Genetic Equilibrium | X |  |  | Students need to know that some populations are at genetic equilibrium and do not evolve. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Hardy-Weinberg Principle | X |  |  | Students need to know that some populations are at genetic equilibrium and do not evolve. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| The Process of Speciation | X |  |  | Students need to be familiar with the changes that lead to the formations of new species. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Isolating Mechanisms | X |  |  | Students need to be familiar with the changes that lead to the formations of new species. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Testing Natural Selection in Nature | X |  |  | Students need to be aware that evolutionary change can be observed in nature and be familiar with the ways that it has been viewed. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Speciation in Darwin’s Finches | X |  |  | Students need to be aware that evolutionary change can be observed in nature and be familiar with the ways that it has been viewed. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |
| Evolution Since Darwin | X |  |  | Students need to know that evolution is still being widely studied and that there are many unanswered questions. | **12.A.4c** Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry. |

Use the table below to complete parts 4 & 5 of your Unit Plan Assignment.

|  |  |
| --- | --- |
| Concept | Objective(s) |
| Genetic Variation | Students will be able to explain the sources of genetic variation. |
| Single-Gene and Polygenic Traits | Students will be able to discuss the differences between single-gene and polygenic traits. |
| Natural Selection on single-gene and polygenic traits | Students will be able to discuss the different ways the natural selection acts on single-gene and polygenic traits.  Students will be able to list the different types of selection. |
| Genetic Drift | Students will be able to define genetic drift.  Students will be able to relate genetic drift to natural selection. |
| Evolution Versus Genetic Equilibrium | Students will be able to explain the conditions in which evolution does not occur. |
| Hardy-Weinberg Principle | Students will be able to discuss the Hardy-Weinberg principle.  Students will be able to list the five conditions that are required to maintain genetic equilibrium. |
| The Process of Speciation | Students will be able to explain the process of speciation. |
| Isolating Mechanisms | Students will be able to list and compare and contrast the different types of isolating mechanisms. |
| Testing Natural Selection in Nature | Students will be able to discuss how natural selection can be viewed in nature. |
| Speciation in Darwin’s Finches | Students will be able to discuss natural selection by using the work of Darwin’s finches. |
| Evolution Since Darwin | Students will be able to explain that the study of evolution is an ongoing process. |

Use the table below to complete part 6 of your Unit Plan Assignment.

|  |  |  |  |
| --- | --- | --- | --- |
| Objective | Possible Teaching Strategies | Final Choice | Rationale |
| Students will be able to explain the sources of genetic variation. | Lecture, models, discussion, and activities. | Lecture | Lecture would be the most appropriate strategy because it would introduce new material to the students. |
| Students will be able to discuss the differences between single-gene and polygenic traits. | Lecture, models, discussion, and activities. | Activity | Doing an activity will allow the students to see the different traits that are determined by single genes and multiple genes. |
| Students will be able to discuss the different ways the natural selection acts on single-gene and polygenic traits.  Students will be able to list the different types of selection. | Lecture, models, discussion, and activities. | Lecture/Discussion | A lecture will be used to introduce the students to natural selection. The discussion will allow the students to share their thoughts about different types of selection. |
| Students will be able to define genetic drift.  Students will be able to relate genetic drift to natural selection. | Lecture, models, discussion, and activities. | Lecture | A lecture will help the students define genetic drift. It will also inform the students of the differences between genetic drift and natural selection. |
| Students will be able to explain the conditions in which evolution does not occur. | Lecture, models, discussion, and activities. | Lecture/Discussion | A lecture and discussion will help clear up any misunderstandings about genetic equilibrium. |
| Students will be able to discuss the Hardy-Weinberg principle.  Students will be able to list the five conditions that are required to maintain genetic equilibrium. | Lecture, models, discussion, and activities. | Lecture/Activity | First, a lecture will be used to introduce the Hardy-Weinberg principle, and then an activity will be used to identify the five conditions that are required to maintain genetic equilibrium. This will help the students remember the Hardy-Weinberg principal and the five conditions for the test. |
| Students will be able to explain the process of speciation. | Lecture, models, discussion, and activities. | Lecture | A lecture will help the students define speciation and how it takes place. |
| Students will be able to list and compare and contrast the different types of isolating mechanisms. | Lecture, models, discussion, and activities. | Activity | A worksheet about isolating mechanisms will be used to help the students compare and contrast the different types. |
| Students will be able to discuss how natural selection can be viewed in nature. | Lecture, models, discussion, and activities. | Discussion | Students can discuss with one another different ways that natural selection can be viewed in nature. |
| Students will be able to discuss natural selection by using the work of Darwin’s finches. | Lecture, models, discussion, and activities. | Lecture | A lecture will be used to explain Darwin’s work with finches and show how it is an example of speciation. |
| Students will be able to explain that the study of evolution is an ongoing process. | Lecture, models, discussion, and activities. | Lecture/Discussion | The students will become aware of the fact that evolution is an ongoing process and be able to discuss some of the unanswered questions about evolution. |

Use the table below to complete part 7 of your Unit Plan Assignment.

|  |  |  |  |
| --- | --- | --- | --- |
| Objective | Possible Assessment Strategies | Final Choice | Rationale |
| Students will be able to explain the sources of genetic variation. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | KWL | A KWL will be used to see what the students know about genetic variation, what they want to know about it, and what they have learned about it. |
| Students will be able to discuss the differences between single-gene and polygenic traits. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Homework-Essay question | Students should be able to write a short essay explaining the differences between single-gene and polygenic traits. |
| Students will be able to discuss the different ways the natural selection acts on single-gene and polygenic traits.  Students will be able to list the different types of selection | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Teacher observation/homework | An experiment will be used to see if the students understand the different ways natural selection acts on single-gene and polygenetic traits. |
| Students will be able to define genetic drift.  Students will be able to relate genetic drift to natural selection. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Test-Pop quiz | A pop quiz will allow the teacher to see what the students have learned from the previous material before continuing on to new concepts. |
| Students will be able to explain the conditions in which evolution does not occur. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Homework-Short essay | Students will complete a short essay assignment showing that they understand that there are instances were evolution does not occur. |
| Students will be able to discuss the Hardy-Weinberg principle.  Students will be able to list the five conditions that are required to maintain genetic equilibrium. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Homework- | Students must list the five conditions that are required to maintain genetic equilibrium and give a brief description of each. |
| Students will be able to explain the process of speciation. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Test- At the end of the hour quiz | A quiz will be used at the end of the hour to see if the students were paying attention to the lecture. |
| Students will be able to list and compare and contrast the different types of isolating mechanisms. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Homework-Multiple choice and matching | Students will be able to identify the differences between the types of isolating mechanisms using a multiple choice and matching homework assignment. |
| Students will be able to discuss how natural selection can be viewed in nature. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Test- End of hour quiz | A quiz will be used at the end of the hour to see if the students were paying attention to the lecture. |
| Students will be able to discuss natural selection by using the work of Darwin’s finches. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | Homework-Comparison chart and short essay question | Students will use the homework to describe the differences between the Galapagos Islands Finches. This will show that they understand how speciation occurs. |
| Students will be able to explain that the study of evolution is an ongoing process. | Teacher observations, comparison charts, tests, homework, KWLs or diagrams. | KWL | This will allow the students to make a revised version of what the student knows, wants to know, and what they have learned about the entire unit. |

Use the table below to complete part 8 of your Unit Plan Assignment.

|  |  |  |
| --- | --- | --- |
| Science Laboratory Skill | Related Objective(s)? | Teaching Strategy? |
| Genetic Diversity in Bacteria | Students will be able to list the different types of selection (directional, stabilizing, and disruptive). | Experiment |
| Natural Selection with Teddy Grahams | Students will be able to discuss the different ways that natural selection acts on single-gene and polygenic traits. | Inquiry |

**Unit Plan Overview (Part 9)**

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| --- | --- | --- | --- | --- |
| **Day** | **Objective** | **Teaching Strategy** | **Assessment Strategy** | **Notes** |
| 1 | Students will be able to explain the sources of genetic variation. | Lecture | KWL | -Computer and power point for lecture |
| 2 | Students will be able to discuss the differences between single-gene and polygenic traits. | Activity | Homework-Essay question | -Homework |
| 3 | Students will be able to discuss the different ways the natural selection acts on single-gene and polygenic traits.  Students will be able to list the different types of selection | Lab/Lecture | Teacher observation/ homework | -Computer and power point for lecture  -Materials for lab- Bears: Happy and Sad (Teddy Graham crackers) Graph Paper  -Lab worksheets |
| 4 | Students will be able to define genetic drift.  Students will be able to relate genetic drift to natural selection. | Lab/Lecture | Teacher observation/ homework | -Computer and power point for lecture  -Materials for lab- liquid bacterial culture, sterile swabs, agar plate, marking pencil, antibiotic paper disks, forceps, transparent tape, 70% alcohol, metric ruler  - Lab worksheets |
| 5 | Students will be able to explain the conditions in which evolution does not occur. | Lecture/Discussion | Homework-Short essay | -Computer and power point for lecture  -Discussion questions  -Homework |
| 6 | Students will be able to discuss the Hardy-Weinberg principle.  Students will be able to list the five conditions that are required to maintain genetic equilibrium. | Lecture/Activity | Homework- | -Computer and power point for lecture  -Worksheets |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Day** | **Objective** | **Teaching Strategy** | **Assessment Strategy** | **Notes** |
| 7 | Students will be able to explain the process of speciation. | Lecture | Test- At the end of the hour quiz | -Computer and power point for lecture  -Quiz |
| 8 | Students will be able to list and compare and contrast the different types of isolating mechanisms. | Lecture/Activity | Homework-Multiple choice and matching | -Computer and power point for lecture  -Worksheets |
| 9 | Students will be able to discuss how natural selection can be viewed in nature. | Lecture/Discussion | Test- End of hour quiz | -Computer and power point for lecture  -Discussion questions  -Quiz |
| 10 | Students will be able to discuss natural selection by using the work of Darwin’s finches. | Lecture | Homework-Comparison chart and short essay question | -Computer and power point for lecture  -Homework |
| 11 | Students will be able to explain that the study of evolution is an ongoing process. | Lecture/Discussion | KWL | -Computer and power point for lecture  -Discussion questions  -Study guides for test |
| 12 | Unit Test | Provide instructions for the test. | Unit Test | -Tests and scantron sheets |

Use the table below to complete part 10 of your Unit Plan Assignment.

|  |  |  |  |
| --- | --- | --- | --- |
| Units Preceding This One | Reasoning | Unit Following This One | Reasoning |
| Cell biology-Genetics | This would be a good way have the students become familiar with genes and different mutations. These units would make it an easy transition into evolution of populations. | Ecology, biomes, and ecosystems | After students have learned how populations have evolved it would be important to start looking at how populations interact with one another and their environment. |